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CULVERT REPLACEMENT SCHEDULE

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Rev. 07/10/02

SOLUTIA
Applied Chemistry, Creative Solutions

Solutia Inc.
575 Maryville Centre Drive
St. Louis, Missouri 63141

P.O. Box 66760
St. Louis, Missouri 63166-6760
Tel 314-674-1000

October 29, 1999
(Via Certified Mail)

Mr. Kevin Turner
Environmental Scientist, OSC
U. S. Environmental Protection Agency
c/o Crab Orchard National Wildlife Refuge
8588 Rt. 148, Marion, IL 62959

Re: June 21, 1999 U. S. EPA UAO - Docket No. V-W-99-C-554
Dead Creek Culverts - Sauget Area I ("UAO")

Dear Mr. Turner,

This letter is in response to U. S. EPA's ("EPA") September 24, 1999 letter to Solutia commenting on Solutia's July 30, 1999 Response to the referenced UAO. In its July 30 Response to the UAO, Solutia proposed the following Work elements for inclusion in the Order:

2. Reduce the potential for creek bank overflow

    2.1. Remove above grade vegetation in the creek bed between Route 3 and the Terminal Railway ROW.
    2.2. Remove and replace the culvert at Cargill Road.
    2.3. Remove the culvert and open a channel at the Terminal Railroad ROW

3. Address the contamination source

    3.1. Install facilities to pump water from Sector B to the American Bottoms Waste Treatment Plant (WTP) during periods of high flow conditions
    3.2. Remove contaminated sediments from Sector B and contain in an on-site double-lined containment cell.

In a September 24 response to Solutia, EPA took the following positions on these proposals. In summary:

- Items 1.1, 1.2 and 1.3 were approved for implementation without modification and no Work Plan was required.
- Item 2.1 was approved conceptually with a Work Plan required. The Work Plan was requested by the end of October.
- Item 2.2 was considered to be outside the scope of this UAO. EPA agreed conceptually that it is possible to do the work proposed by 2.2 under EPA's removal authority. EPA requested more information on 2.2 and further stated that some sort of additional enforcement document would be needed before work could begin.

As requested in EPA's September 24 letter, Solutia began work immediately upon receipt and has made significant progress toward implementation of Items 1.1, 1.2 and 1.3. The following documents are enclosed to illustrate work completed to date and remaining scope and schedule:

1. Access agreement requests (6)
2. Replacement Culverts design
3. Culverts Replacement Schedule

As you can see from the culverts design and detailed schedule, the culverts replacement installation is more complicated than originally envisioned. There are 5 utility pipelines within the Terminal Railway right-of-way, above the culvert grade. The presence of these pipelines will necessitate a revised approach to installation - one utilizing pipe supports, sheeting and backfilling of the excavation - vs. the original concept of constructing a permanent open V-notch in the ROW for improved flow. In addition, the county has asked that they be allowed to coordinate some previously planned work on Cargill Road, when we install the replacement culvert. The nature of this work and potential impact on schedule is not fully understood at this time.

With respect to the culverts replacement schedule, there are two critical path items, one for each of the two culverts and estimated at 30 days each, over which Solutia has little control. These are the "County review of Design" (Line 2005) for Cargill Road and "Phillips review of Sheeting Design" (Line 2009), for the Terminal Railroad ROW. We have no feedback on how difficult it will be to complete either of these tasks, but we have experienced delays in the past obtaining access agreements from railway companies. Delay beyond the projected 30 days duration for either of these items could push the beginning of installation into the Spring rainy season. This in turn could necessitate a delay in installation initiation beyond that shown in the attached schedule, so as to avoid construction during annual peak flow conditions.

Solutia proposed two actions to address the contamination source in its July 30 Response to the UAO.

2.1. Install facilities to pump water from Sector B to the American Bottoms Waste Treatment Plant (WTP) during periods of high flow conditions

2.2. Remove contaminated sediments from Sector B and contain in an on-site double-lined containment cell.

It is Solutia's position that these two actions cannot be practically separated. There is a long list of pretreatment requirements that must be met by the stormwater before it can be discharged to the ABWTP. For instance, there would be a PCB limit of < 3 PPB in the discharged stormwater[1]. During storm conditions, we believe that it is highly likely that the PCB limit would be exceeded, because of small quantities of sediments that would normally be entrained by the stormwater discharge. While the TSCA water discharge limit is Solutia's greatest concern, if the water discharged to the ABWTP exceeds any of its permit limits for other effluent standards as well, for contaminates such as lead or copper for instance, some sort of pretreatment would be required for those materials also. In order to insure success, we believe it is essential that the sediments be removed from Sector B prior to discharging stormwater from Sector B to the ABWTP.

Therefore, it is Solutia's recommendation that pumping of the stormwater to the ABWTP and removal of the contaminated sediments from Sector B and containment in an on-site double-lined containment cell, be evaluated and approved simultaneously. Relevant to the need for timely action required by the UAO and consistent with this recommendation, Solutia committed in an October 26, 1999 correspondence to EPA to a November 8 date for submittal of an evaluation of alternatives to an on-site containment cell for dealing with the contaminated sediments, and to a December 3 date for submittal of an on-site containment cell design.

In conclusion, Solutia will perform the culvert modifications already approved under this UAO and will continue to negotiate in good faith an enforceable commitment to implement the additional proposed Work, whether said Work is agreed to be performed under this UAO or another order.

Sincerely,

D. M. Light
Manager, Remedial Projects
Solutia Inc.

cc: Mr. Thomas Martin, Esq. - USEPA
Mr. Mike McAteer - USEPA
Ms. Candy Morin - IEPA

[1] TSCA regulations at Section 761.50, "No person may discharge water containing PCBs to a treatment works or to navigable waters unless the PCB concentration is less than 3 ug/l (approximately 3 PPB) or unless the discharge is in accordance with a PCB discharge limit included in a permit issued under section 307(b) or 402 of the Clean Water Act."

UAO

ACCESS

AGREEMENT

REQUESTS

OCT 22 1999

THOMPSON COBURN

Thompson Coburn LLP
Attorneys at Law

One Mercantile Center
St. Louis, Missouri 63101-1693
314-552-6000
FAX 314-552-7000
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October 20, 1999

Colleen E. Michuda
314-552-6563
FAX 314-552-7563
EMAIL cmichuda@
thompsoncoburn.com

Via Certified Mail

Mayor Mike King
Village of Cahokia
212 Cahokia Park Drive
Cahokia, Illinois 62206

Re: Additional Access required for stormwater and drainage improvements at intersection of Terminal Railroad, Fox Terminal Road, and Dead Creek, and for stormwater management activities at Judith Lane

Dear Mayor King:

In September of this year, the Village of Cahokia ("Village") granted Solutia Inc. ("Solutia") access to Village property in Cahokia, Illinois, for purposes of sampling both soil and groundwater. As you know, access for sampling is required pursuant to a January 21, 1999 Administrative Order by Consent between Solutia and the U.S. Environmental Protection Agency ("U.S. EPA").

Solutia is now requesting your cooperation in a related matter. Additional access to Village property will be required pursuant to a separate Unilateral Administrative Order ("UAO") issued to Solutia by U.S. EPA. This UAO requires that Solutia conduct certain removal actions to address the potential migration of contaminants caused by the overflow of waters from Dead Creek and its associated culverts. Under the terms of this UAO, Solutia will be required to make certain stormwater and drainage improvements, including the removal and replacement of the existing culverts, at the intersection of the Terminal Railroad and Dead Creek, and Fox Terminal Road and Dead Creek, in Cahokia, Illinois. Solutia will require access to adjacent Village property in order to make these required improvements to Dead Creek and its associated culverts. Note that access to Village property is needed mainly for the storage of materials and equipment required for the performance of these improvements.

Although the Village has already granted Solutia access to Village property pursuant to the September 9, 1999 Access Agreement, Solutia would like to expand the scope of the permitted access to include activities required under the UAO. To that end, please review the enclosed

"Addendum to Access Agreement" and let me know whether this Addendum is acceptable to you. If this Addendum is acceptable, please sign both originals and return them to me at the above address. I will then secure Solutia's signature, and return one executed original to you for your files.

If you have any questions or need additional information, please let me know. Also, given the time constraints within which this work must be completed, I ask that you respond within seven days of receipt of this letter. Thank you for your timely cooperation in this matter.

Very truly yours,

Thompson Coburn LLP

By Colleen E. Michuda
Colleen E. Michuda

CEM/gao

Enclosures

cc: D. M. Light

ADDENDUM TO ACCESS AGREEMENT
BETWEEN VILLAGE OF CAHOKIA AND SOLUTIA INC.

Pursuant to the Access Agreement ("Agreement"), dated September 9, 1999, entered into between the Village of Cahokia and Solutia Inc. ("Solutia"), Solutia is permitted to access property owned by the Village of Cahokia for purposes of conducting soil and groundwater sampling as required by a January 21, 1999, Administrative Order by Consent between Solutia and U.S. EPA.

This Addendum acknowledges that Solutia shall also be permitted to access Village of Cahokia property for purposes of making certain stormwater and drainage improvements in and around Dead Creek, and for storing certain materials and equipment needed for such improvements. This additional access shall be subject to the same terms and conditions of the original Access Agreement.

Acknowledged and agreed to this _____ day of _____, 1999.

SOLUTIA INC.

By: _____

Title: _____

VILLAGE OF CAHOKIA

By: _____

Title: _____

THOMPSON COBURN

Thompson Coburn LLP
Attorneys at Law

One Mercantile Center
St. Louis, Missouri 63101-1693
314-552-6000
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www.thompsoncoburn.com

October 20, 1999

Colleen E. Michuda
314-552-6563
FAX 314-552-7563
EMAIL cmichuda@
thompsoncoburn.com

Via Certified Mail

Abundant Love Fellowship Church
93 Water Street
Cahokia, Illinois 62206

Re: **Access Agreement for stormwater and drainage improvements along Dead Creek**

Dear Sir/Madam:

Attached for your consideration is a proposed Access Agreement to permit Solutia Inc. ("Solutia") and its contractors, to access property owned by the Abundant Love Fellowship Church ("Church") in St. Clair County, Illinois.

This access will be required pursuant to a Unilateral Administrative Order ("UAO") issued to Solutia by the U.S. Environmental Protection Agency. This UAO requires that Solutia conduct certain removal actions to address the potential migration of contaminants caused by the overflow of waters from Dead Creek and its associated culverts. Under the terms of this UAO, Solutia will be required to make certain stormwater and drainage improvements, including the removal of vegetation, along Dead Creek. Solutia is requesting access to Church property adjacent to the creek in order to make these required improvements. Solutia is willing to coordinate performance of this work with the church so as to minimize the disruption to normal activities at this location.

Due to the time constraints within which this work must be completed, please notify me within seven days of receipt of this letter as to whether this Agreement is acceptable to you. If the Agreement is acceptable, please have the appropriate person execute both originals and return them to me at the above address. I will then return one original, signed by Solutia, to you for your files.

If you have questions, or if you need additional information, please contact me at the above number.

Thank you for your timely cooperation in this matter.

Very truly yours,

Thompson Coburn LLP

By Colleen E. Michuda
Colleen E. Michuda

CEM/cem

Enclosures

cc: D. M. Light

ACCESS AGREEMENT

This Agreement is made as of the _____ day of _____, 1999 between Abundant Love Fellowship Church, a land owner in St. Clair County, Illinois, and Solutia Inc. ("Solutia"), whose principal offices are located at 575 Maryville Centre Drive, St. Louis, Missouri 63141.

WHEREAS, Solutia has requested permission to enter upon the property of the above-listed owner at the address listed below to perform certain stormwater and drainage improvements.

WHEREAS, Abundant Love Fellowship Church is willing to grant Solutia a revocable license for the purpose aforesaid.

NOW, THEREFORE, in consideration of and conditioned upon the mutual covenants, promises and agreements stated herein, the parties agree as follows:

1. Abundant Love Fellowship Church grants to Solutia a revocable license to enter upon real property owned by Abundant Love Fellowship Church, located at 93 Water Street, parcel numbers 06-03.0-200-006 and 06-03.0-200-002 ("the Property"), for the purpose of performing certain stormwater and drainage improvements ("the Work") along Dead Creek. The Work may include the removal of vegetation as well as the temporary storage of equipment and materials incident to the performance of such improvements.

2. Said access shall be limited to those officers, employees, and contractors of Solutia ("Solutia Personnel"), as designated by Solutia, whose presence is necessary to further the purposes of this Agreement. Such access shall also be granted to U.S. EPA employees, contractors, agents, consultants, designees, representatives, and State of Illinois representatives ("Government Personnel") for the purpose of monitoring the Work being performed by Solutia Personnel.

3. Solutia shall coordinate performance of the Work with Abundant Love Fellowship Church so as to minimize the disruption to activities on the Property.

4. Solutia agrees that upon completion of the Work, all material and equipment shall be removed from the Property. Solutia will use all reasonable efforts to ensure that the Work permitted by this Agreement is performed in a manner consistent with prevailing professional standards for all areas of activities undertaken by Solutia Personnel.

5. As to the Work to be done, or services to be performed by Solutia or its consultants, Solutia assumes responsibility for any liability for losses, expenses, damages, demands and claims in connection with or arising out of any injury or damage to Property, sustained in connection with or to have arisen out of the actual performance of the Work hereunder. Solutia shall indemnify, defend and save harmless the land owner of the above-described Property from and against any and all claims, demands, actions, causes of action, suits, damages, expenses (including attorney's fees and experts' fees) directly resulting from any liability described in the preceding sentence. This indemnity does not cover any preexisting conditions on the Property, except to the extent that such condition is altered through the negligent conduct or action of Solutia and/or its contractor while working on the above-described Property and thereby results in damage to the Property that would not have otherwise occurred.

6. Abundant Love Fellowship Church shall advise Solutia of any utility lines, pipelines, or other hazardous or potentially hazardous conditions of which Abundant Love Fellowship Church has actual knowledge that might reasonably be expected to be damaged by the Work to be performed hereunder or that might significantly interfere with the performance of the Work provided herein.

IN WITNESS WHEREOF, the parties have caused this Access Agreement to be executed the day and year first above written.

ABUNDANT LOVE FELLOWSHIP CHURCH

BY:_____
NAME:_____
ADDRESS:_____

_____
Parcel Nos. 06-03.0-200-001
06-03.0-200-002

SOLUTIA INC.

BY:_____
TITLE:_____

THOMPSON COBURN

Thompson Coburn LLP
Attorneys at Law

One Mercantile Center
St. Louis, Missouri 63101-1693
314-552-6000
FAX 314-552-7000

October 20, 1999

Colleen E. Michuda
314-552-6563
FAX 314-552-7563
EMAIL cmichuda@
thompsoncoburn.com

Via Certified Mail

Mr. Daryl Kates
St. Clair County
1415 North Belt West
Belleville, IL 62226

Re: **Access Agreement for stormwater and drainage improvements at the intersection of Fox Terminal Road and Dead Creek in Cahokia, Illinois**

Dear Daryl:

Per our conversation last week, attached for your consideration is a proposed Access Agreement to permit Solutia Inc. ("Solutia") and its contractors to access and make improvements upon property owned by St. Clair County ("the County") in Cahokia, Illinois.

This access will be required pursuant to a Unilateral Administrative Order issued to Solutia by the U.S. Environmental Protection Agency. This Order requires that Solutia conduct certain removal actions to address the potential migration of contaminants caused by the overflow of waters from Dead Creek and its associated culverts. Under the terms of this Order, Solutia will be required to make certain stormwater and drainage improvements, including the replacement of the culvert, at the intersection of Fox Terminal Road and Dead Creek in Cahokia. Solutia is requesting access from the County in order to perform the required work at this location.

Due to the time constraints within which this work must be completed, please notify me within seven days of receipt of this letter, as to whether this Agreement is acceptable to you. If this Agreement is acceptable, please have the appropriate person execute both originals and return them to me at the above address. I will then return one original, signed by Solutia, to you for your files.

Please also notify me of any other County requirements with which Solutia must comply. Solutia is willing to coordinate performance of these activities with the County so as to minimize disruption to the traffic and other activities along Fox Terminal Road.

If you have questions, or if you need additional information, please contact me at the above number.

Thank you for your timely cooperation in this matter.

Very truly yours,

Thompson Coburn LLP

By Colleen E. Michuda
Colleen E. Michuda

CEM/cem

Enclosures

cc: D. M. Light

ACCESS AGREEMENT

This Agreement is made as of the _____ day of _____, 1999 between St. Clair County, a land owner in Cahokia, Illinois, and Solutia Inc. ("Solutia"), whose principal offices are located at 575 Maryville Centre Drive., St. Louis, Missouri 63141.

WHEREAS, Solutia has requested permission to enter upon the property of the above-listed owner at the address listed below to perform certain stormwater and drainage improvements.

WHEREAS, St. Clair County is willing to grant Solutia a revocable license for the purpose aforesaid.

NOW, THEREFORE, in consideration of and conditioned upon the mutual covenants, promises and agreements stated herein, the parties agree as follows:

1. St. Clair County grants to Solutia a revocable license to enter upon real property owned by St. Clair County, located at Fox Terminal Road and Dead Creek in Cahokia, Illinois ("the Property"), for the purpose of performing certain stormwater and drainage improvements ("the Work") along Dead Creek. The Work may also include the temporary storage of equipment and materials incident to the performance of such stormwater and drainage improvements.

2. Said access shall be limited to those officers, employees, and contractors of Solutia ("Solutia Personnel"), as designated by Solutia whose presence is necessary to further the purposes of this Agreement. Such access shall also be granted to U.S. EPA employees, contractors, agents, consultants, designees, representatives, and State of Illinois representatives ("Government Personnel") for the purpose of monitoring the Work being performed by Solutia Personnel.

3. Solutia shall coordinate performance of the Work with St. Clair County so as to minimize the disruption to activities and traffic along Fox Terminal Road.

4. Solutia agrees that upon completion of the Work, all material and equipment shall be removed from the Property. Solutia will use all reasonable efforts to ensure that the Work permitted by this Agreement is performed in a manner consistent with prevailing professional standards for all areas of activities undertaken by Solutia Personnel.

5. As to the Work to be done, or services to be performed by Solutia or its consultants, Solutia assumes responsibility for any liability for losses, expenses, damages, demands and claims in connection with or arising out of any injury or damage to property, sustained in connection with or to have arisen out of the actual performance of the Work hereunder. Solutia shall indemnify, defend and save harmless the land owner of the above-described Property from and against any and all claims, demands, actions, causes of action, suits, damages, expenses (including attorney's fees and experts' fees) directly resulting from any liability described in the preceding sentence. This indemnity does not cover any preexisting conditions on the Property, except to the extent that such condition is altered through the negligent conduct or action of Solutia and/or its contractor while working on the above-described Property and thereby results in damage to the Property that would not have otherwise occurred.

6. St. Clair County shall advise Solutia of any utility lines, pipelines, or other hazardous or potentially hazardous conditions of which St. Clair County has actual knowledge that might reasonably be expected to be damaged by the Work to be performed hereunder or that might significantly interfere with the performance of the Work provided herein.

IN WITNESS WHEREOF, the parties have caused this Access Agreement to be executed the day and year first above written.

BY:_____
NAME:_____
ADDRESS:_____
_____

SOLUTIA INC.

BY:_____
TITLE:_____

THOMPSON COBURN

Thompson Coburn LLP
Attorneys at Law

One Mercantile Center
St. Louis, Missouri 63101-1693
314-552-6000
FAX 314-552-7000

October 20, 1999

Colleen E. Michuda
314-552-6563
FAX 314-552-7563
EMAIL cmichuda@
thompsoncoburn.com

Via Certified Mail

Ms. Susan B. Knowles
Ameren UE
One Ameren Plaza
1901 Chouteau Avenue
P.O. Box 66149
St. Louis, MO 63166-6149

Re: Additional Access required for stormwater and drainage improvements at intersection of Terminal Railroad, Fox Terminal Road, and Dead Creek

Dear Susan:

In June of this year, Ameren UE granted Solutia Inc. ("Solutia") access to Ameren UE property in Cahokia, Illinois, for purposes of sampling both soil and groundwater. As you know, access for sampling is required pursuant to a January 21, 1999 Administrative Order by Consent between Solutia and the U.S. Environmental Protection Agency ("U.S. EPA").

Solutia is now requesting your cooperation in a related matter. Additional access to Ameren UE property will be required pursuant to a separate Unilateral Administrative Order ("UAO") issued to Solutia by U.S. EPA. This UAO requires that Solutia conduct certain removal actions to address the potential migration of contaminants caused by the overflow of waters from Dead Creek and its associated culverts. Under the terms of this UAO, Solutia will be required to make certain stormwater and drainage improvements, including the removal and replacement of the existing culverts, at the intersection of the Terminal Railroad and Dead Creek, and Fox Terminal Road and Dead Creek, in Cahokia, Illinois. Solutia will require access to adjacent Ameren UE property in order to make these required improvements.

Although Ameren UE has already granted Solutia access to this property pursuant to the June 1999 Access Agreement, Solutia would like to expand the scope of the permitted access to include the above-listed stormwater and drainage improvements required by the UAO. To that end, please review the enclosed "Addendum to Access Agreement," and let me know whether

this Addendum is acceptable to you. If it is acceptable, please have Dennis Weisenborn sign both originals, and return them to me at the above address. I will then secure Solutia's signature, and return one executed original to you for your files.

If you have any questions or need additional information, please let me know. Also, given the time constraints within which this work must be completed, I ask that you respond within seven days of receipt of this letter. Thank you for your timely cooperation in this matter.

Very truly yours,

Thompson Coburn LLP

By Colleen E. Michuda
Colleen E. Michuda

CEM/gao

Enclosures

cc: D. M. Light

ADDENDUM TO ACCESS AGREEMENT
BETWEEN AMEREN UE AND SOLUTIA INC.

Pursuant to the Access Agreement ("Agreement"), dated June 11, 1999, entered into between Ameren UE and Solutia Inc. ("Solutia"), Solutia is permitted to access property owned by Ameren UE for purposes of conducting soil and groundwater sampling as required by a January 21, 1999 Administrative Order by Consent between Solutia and U.S. EPA.

This Addendum acknowledges that Solutia shall also be permitted to access Ameren UE property for purposes of making certain stormwater and drainage improvements in and around Dead Creek, and for storing certain materials and equipment needed for such improvements. This additional access shall be subject to the same terms and conditions of the original Access Agreement.

Acknowledged and agreed to this _____ day of _____, 1999.

SOLUTIA INC.

By: _____

Title: _____

AMEREN UE

By: _____

Title: _____

THOMPSON COBURN

Thompson Coburn LLP
Attorneys at Law

One Mercantile Center
St. Louis, Missouri 63101-1693
314-552-6000
FAX 314-552-7000

October 20, 1999

Colleen E. Michuda
314-552-6563
FAX 314-552-7563
EMAIL cmichuda@
thompsoncoburn.com

Via Certified Mail

Terminal Railroad Association
700 N. 2nd Street
St. Louis, MO 63102

Re: **Access Agreement for stormwater and drainage improvements at intersection of Terminal Railroad and Dead Creek**

Dear Sir/Madam:

Attached for your consideration is a proposed Access Agreement to permit Solutia Inc. ("Solutia") and its contractors, to access and make improvements upon property owned by the Terminal Railroad Association ("the Railroad") in St. Clair County, Illinois.

This access will be required pursuant to a Unilateral Administrative Order ("UAO") issued to Solutia by the U.S. Environmental Protection Agency. This UAO requires that Solutia conduct certain removal actions to address the potential migration of contaminants caused by the overflow of waters from Dead Creek and its associated culverts. Under the terms of this UAO, Solutia will be required to make certain stormwater and drainage improvements, including the removal and replacement of the existing culverts, at the intersection of the Terminal Railroad and Dead Creek, in Cahokia, Illinois Solutia is requesting access to Terminal Railroad property at this location in order to make the required improvements. Solutia is willing to coordinate performance of this work with the Railroad so as to minimize the disruption to normal activities at this location.

Due to the time constraints within which this work must be completed, please notify me within seven days of receipt of this letter as to whether this Agreement is acceptable to you. If the Agreement is acceptable, please have the appropriate person execute both originals and return them to me at the above address. I will then return one original, signed by Solutia, to you for your files.

If you have questions, or if you need additional information, please contact me at the above number.

1282533

Thank you for your timely cooperation in this matter.

Very truly yours,

Thompson Coburn LLP

By Colleen E. Michuda
Colleen E. Michuda

CEM/cem

Enclosures

cc: D. M. Light

ACCESS AGREEMENT

This Agreement is made as of the _____ day of _____, 1999 between the Terminal Railroad Association ("Terminal Railroad"), a land owner in St. Clair County, Illinois, and Solutia Inc. ("Solutia"), whose principal offices are located at 575 Maryville Centre Drive., St. Louis, Missouri 63141.

WHEREAS, Solutia has requested permission to enter upon the property of the above-listed owner at the address listed below to perform certain stormwater and drainage improvements.

WHEREAS, the Terminal Railroad is willing to grant Solutia a revocable license for the purpose aforesaid.

NOW, THEREFORE, in consideration of and conditioned upon the mutual covenants, promises and agreements stated herein, the parties agree as follows:

1. The Terminal Railroad grants to Solutia a revocable license to enter upon real property owned by the Terminal Railroad, located at the intersection of the Terminal Railroad and Dead Creek in Cahokia, Illinois ("the Property"), for the purpose of performing certain stormwater and drainage improvements ("the Work") along Dead Creek. The Work may also include the temporary storage of equipment and materials incident to the performance of such stormwater and drainage improvements.

2. Said access shall be limited to those officers, employees, and contractors of Solutia ("Solutia Personnel"), as designated by Solutia whose presence is necessary to further the purposes of this Agreement. Such access shall also be granted to U.S. EPA employees, contractors, agents, consultants, designees, representatives, and State of Illinois representatives ("Government Personnel") for the purpose of monitoring the Work being performed by Solutia Personnel.

3. Solutia shall coordinate performance of the Work with the Terminal Railroad so as to minimize the disruption to activities on the Property.

4. Solutia agrees that upon completion of the Work, all material and equipment shall be removed from the Property. Solutia will use all reasonable efforts to ensure that the Work permitted by this Agreement is performed in a manner consistent with prevailing professional standards for all areas of activities undertaken by Solutia Personnel.

5. As to the Work to be done, or services to be performed by Solutia or its consultants, Solutia assumes responsibility for any liability for losses, expenses, damages, demands and claims in connection with or arising out of any injury or damage to property, sustained in connection with or to have arisen out of the actual performance of the Work hereunder. Solutia shall indemnify, defend and save harmless the land owner of the above-described Property from and against any and all claims, demands, actions, causes of action, suits, damages, expenses (including attorney's fees and experts' fees) directly resulting from any liability described in the preceding sentence. This indemnity does not cover any preexisting conditions on the Property, except to the extent that such condition is altered through the negligent conduct or action of Solutia and/or its contractor while working on the above-described Property and thereby results in damage to the Property that would not have otherwise occurred.

6. The Terminal Railroad shall advise Solutia of any utility lines, pipelines, or other hazardous or potentially hazardous conditions of which the Terminal Railroad has actual knowledge that might reasonably be expected to be damaged by the Work to be performed hereunder or that might significantly interfere with the performance of the Work provided herein.

IN WITNESS WHEREOF, the parties have caused this Access Agreement to be executed the day and year first above written.

BY:_____
NAME:_____
ADDRESS:_____
_____

SOLUTIA INC.

BY:_____
TITLE:_____

THOMPSON COBURN

Thompson Coburn LLP
Attorneys at Law

One Mercantile Center
St. Louis, Missouri 63101-1693
314-552-6000
FAX 314-552-7000
www.thompsoncoburn.com

October 20, 1999

Colleen E. Michuda
314-552-6563
FAX 314-552-7563
EMAIL cmichuda@
thompsoncoburn.com

Via Certified Mail

Mr. Jose Duran
100 Elm
Cahokia, Illinois 62206

Re: **Access Agreement for stormwater and drainage improvements at intersection of Terminal Railroad, Fox Terminal Road, and Dead Creek**

Dear Mr. Duran:

Attached for your consideration is a proposed Access Agreement to permit Solutia Inc. ("Solutia") and its contractors, to access property you own in St. Clair County, Illinois.

This access will be required pursuant to a Unilateral Administrative Order ("UAO") issued to Solutia by the U.S. Environmental Protection Agency. This UAO requires that Solutia conduct certain removal actions to address the potential migration of contaminants caused by the overflow of waters from Dead Creek and its associated culverts. Under the terms of this UAO, Solutia will be required to make certain stormwater and drainage improvements, including the removal and replacement of the existing culverts, at the intersection of the Terminal Railroad and Dead Creek, and Fox Terminal Road and Dead Creek, in Cahokia, Illinois. Solutia is requesting access to your property at this location in order to make the required improvements. Solutia is willing to coordinate performance of this work with you so as to minimize the disruption to your normal activities at this location.

Due to the time constraints within which this work must be completed, please notify me within seven days of receipt of this letter as to whether this Agreement is acceptable to you. If the Agreement is acceptable, please execute both originals and return them to me at the above address. I will then return one original, signed by Solutia, to you for your files.

If you have questions, or if you need additional information, please contact me at the above number.

Thank you for your timely cooperation in this matter.

Very truly yours,

Thompson Coburn LLP

By Colleen E. Michuda
Colleen E. Michuda

CEM/cem

Enclosures

cc: D. M. Light

ACCESS AGREEMENT

This Agreement is made as of the _____ day of _____, 1999 between Jose Duran, a land owner in St. Clair County, Illinois, and Solutia Inc. ("Solutia"), whose principal offices are located at 575 Maryville Centre Drive., St. Louis, Missouri 63141.

WHEREAS, Solutia has requested permission to enter upon the property of the above-listed owner at the address listed below to perform certain stormwater and drainage improvements.

WHEREAS, Jose Duran, is willing to grant Solutia a revocable license for the purpose aforesaid.

NOW, THEREFORE, in consideration of and conditioned upon the mutual covenants, promises and agreements stated herein, the parties agree as follows:

1. Jose Duran grants to Solutia a revocable license to enter upon real property owned by Jose Duran, located at 100 Elm, parcel number 06-03.0-107-017 ("the Property"), for the purpose of performing certain stormwater and drainage improvements ("the Work") along Dead Creek. The Work may also include the temporary storage of equipment and materials incident to the performance of such improvements.

2. Said access shall be limited to those officers, employees, and contractors of Solutia ("Solutia Personnel"), as designated by Solutia whose presence is necessary to further the purposes of this Agreement. Such access shall also be granted to U.S. EPA employees, contractors, agents, consultants, designees, representatives, and State of Illinois representatives ("Government Personnel") for the purpose of monitoring the Work being performed by Solutia Personnel.

3. Solutia shall coordinate performance of the Work with Jose Duran, so as to minimize the disruption to activities on the Property.

4. Solutia agrees that upon completion of the Work, all material and equipment shall be removed from the Property. Solutia will use all reasonable efforts to ensure that the Work permitted by this Agreement is performed in a manner consistent with prevailing professional standards for all areas of activities undertaken by Solutia Personnel.

5. As to the Work to be done, or services to be performed by Solutia or its consultants, Solutia assumes responsibility for any liability for losses, expenses, damages, demands and claims in connection with or arising out of any injury or damage to property, sustained in connection with or to have arisen out of the actual performance of the Work hereunder. Solutia shall indemnify, defend and save harmless the land owner of the above-described Property from and against any and all claims, demands, actions, causes of action, suits, damages, expenses (including attorney's fees and experts' fees) directly resulting from any liability described in the preceding sentence. This indemnity does not cover any preexisting conditions on the Property, except to the extent that such condition is altered through the negligent conduct or action of Solutia and/or its contractor while working on the above-described Property and thereby results in damage to the Property that would not have otherwise occurred.

6. Jose Duran, shall advise Solutia of any utility lines, pipelines, or other hazardous or potentially hazardous conditions of which Jose Duran has actual knowledge that might reasonably be expected to be damaged by the Work to be performed hereunder or that might significantly interfere with the performance of the Work provided herein.

IN WITNESS WHEREOF, the parties have caused this Access Agreement to be executed the day and year first above written.

BY:_____
NAME:_____
ADDRESS:_____

_____
Parcel No. 06-03.0-107-017

SOLUTIA INC.

BY:_____
TITLE:_____

CULVERTS DESIGN

- Cargill Road
- Terminal Railway ROW

URS Greiner Woodward Clyde
A Division of URS Corporation

2318 Millpark Drive
Maryland Heights, MO 63043
Tel: 314.429.0100
Fax: 314.429.0462
Offices Worldwide

October 13, 1999

Mr. Bruce Yare
Manager, Remedial Projects
Solutia Inc.
575 Maryville Centre Drive
St. Louis, MO 63141

RE: DESIGN OPTIONS NO. 4: HYDRAULIC CULVERT DESIGN FOR ROAD CROSSINGS OF DEAD CREEK, CAHOKIA, ILLINOIS (**CARGILL ELEVATOR AND TERMINAL RAILROAD ROAD CROSSINGS CULVERT DESIGN**): URSWC PROJECT NO. **23-99STL022.00 – TASK 00005**

Dear Bruce:

Pursuant to your authorization of September 29, 1999, presented herein with supplemental attachment are the results of the hydraulic analysis for use of corrugated metal pipe (CMP) culverts for Dead Creek at the Cargill Elevator Road Crossing and the Terminal Railroad Road Crossing. The following summarizes the results of the analyses and presents the proposed culvert pipe selections. The attachment, consisting of narrative, two figures, and four tables, provides more detail and documentation on the development of the recommended culvert pipe selections.

The recommended pipes for the two crossings are intended to replace the previously proposed design (termed Design Option No. 3) for the crossing structures at the Cargill Elevator Road Crossing and the Terminal Railroad Road presented in the July, 1999, *Supplemental Study for Hydrologic and Hydraulic Analyses of Dead Creek, Cahokia, Illinois*. The proposed culvert pipe design presented in this letter report is, for reference, termed Design Option No. 4.

The objective for the culvert design was selection of CMP pipe which would have sufficient capacity to pass the 100-year peak flood flow at the two crossings with no greater head loss than that computed in the Supplemental Study for the proposed crossing structures (i.e., Design Option No. 3). The peak flood discharges and coincident head losses were determined from data in the *Supplemental Study* report. This discharge-head loss design criteria were to be satisfied under the following construction requirement limitations that:

- For the Cargill Elevator Road Crossing: Maximum vertical height (i.e., diameter) of the culverts be not more than approximately 48 inches.
- For the Terminal Railroad Crossing: Maximum vertical height (i.e., diameter) of the culverts be not more than approximately 72 inches.

The design discharge-head loss criteria will assure that backwater effects for a design option selected in this study will not be greater than that determined in the *Supplemental Study* for

the proposed design of Design Option No. 3. The objective was amplified for comprehensiveness to include the 50-year peak flood flow. Data are also presented for the 500-year peak flood flow but the 500-year flood discharge was not considered as part of the design objective. Those potential designs for which the discharge capacity exceeded the required capacity for both the 50-year and 100-year conditions were termed "acceptable" designs while those designs for which the discharge capacity exceeded the required capacity for the 50-year or the 100-year (but not both) conditions were termed "marginal" designs.

The hydraulic analyses were performed in a spreadsheet format using conventional hydraulic calculations which recognized the varying roughness and entrance and exit losses coefficients that would exist for different pipe corrugations, pipe size, and pipe inlet configuration. As a consequence, there were found to be a variety of pipe combinations that would satisfy the design objectives. Those particular designs which did meet the design objectives and satisfy the pipe diameter size constraints were termed feasible alternatives; these are listed in the attached Tables 3 and 4. Marginal (discharge) designs which were not radically deficient in design capacity were also considered as a feasible design because of potential cost savings and the uncertainty in the precise magnitude of 50- and 100-year peak flows (the uncertainty arising because of field data uncertainties underlying the calculations for the *Supplemental Study*). For similar reasons, 54-inch diameter pipes were considered for possible use at the Cargill Road Crossing.

The feasible alternatives were screened for removal of those alternatives which provided unnecessarily large excess capacity or estimated excessively large trench width. Additional screening of the feasible options was provided by an approximate cost index, drawn from published data, which provided an approximate indication of the relative cost of the different pipe combinations as a function of pipe diameter.

From review of the feasible options and their capacity, the index costs, the number of pipes in an alternative, general pipe size range, a limited number (three) of recommended alternative feasible designs was identified for each of the two crossings. These are as follows:

For the Cargill Elevator Road Crossing:

1. Three 48-inch diameter CMPs with helical corrugations and inlet headwall and wing walls or beveled ring entrance.
2. Three 48-inch diameter CMPs with helical corrugations and projecting inlet.
3. Two 54-inch diameter CMPs with helical corrugations and inlet headwall and wing walls or beveled ring entrance

Recommended option 1 above is preferred over option 2 since it has more capacity than option 2, but the cost of option 2 may be significant less than option 1 because of the type of entrance and exit configuration of option 2.

Because recommended option 3 has only marginal capacity and its pipe sizes are greater than 48-inch, this option is recommended only if its cost is significantly lower than the other two options.

The three recommended options identified for the Terminal Railroad Road Crossing are:

1. Four 66-inch and one 54-inch diameter CMPs with annular corrugations and projecting inlet.
2. Four 72-inch diameter CMPs with helical corrugations and inlet headwall and wing walls or beveled ring entrance.
3. Three 72-inch and two 54-inch diameter CMPs, with helical corrugations and inlet headwall and wing walls or beveled ring entrance.

Recommended option 1 is preferred over recommended option 2 because it has "acceptable" capacity while option 2 has only "marginal" (but almost "acceptable") capacity. Construction of option 2 can be expected to incur greater cost than option 1, although option 2 has uniform pipe sizes. The cost indices for options 2 and 3 are sufficiently close to suggest that option 3 may have less construction cost than option 2.

Since the each of the three alternatives in the two sets of recommendations are considered to be of reasonably similar cost, it is recommended final selection of one of the three alternatives for each crossing be based upon review of bid costs for the construction of the two crossings.

Should you have questions about the above recommendations, please feel free to contact us.

URS Greiner Woodward Clyde appreciates the opportunity for providing our services to you.

Sincerely,

Michael A. Collins
Senior Consulting Professional

for Robert B. Billman
Program Director

Attachment

TECHNICAL NARRATIVE

INTRODUCTION

Dead Creek drains a 1.1 square mile watershed in Cahokia, Illinois. Two previous studies have examined flood flow behavior in the creek and its floodplain[1,2]. The later of these two studies, the "Supplemental Study," evaluated the following two crossings of the creek in its downstream reaches:

- Cargill Elevator Road Crossing at river mile 1.205.
- Terminal Railroad Road Crossing at river mile 1.170.

The attached Figures 1 and 2 show the sections at the crossings and stations immediately upstream and downstream[3] of the road crossings.

To facilitate the passage of flood flows, the *Supplemental Study* proposed a design for the two creek crossings, consisting of:

- At the Cargill Elevator Road Crossing: One-72" diameter corrugated metal pipe.
- At the Terminal Railroad Road Crossing: A V-notch cut to the flow line at an approximate 2:1 slope.

These proposed designs for the two crossings were referred to as Design Option No. 3 in the *Supplemental Study*.

Subsequent to the development of Design Option No. 3, field investigation revealed the need for modification of the design to facilitate construction requirements. This report presents alternatives for replacement of Design Option No. 3 with an alternative option, termed Design Option 4.

DESIGN OBJECTIVE AND CONSTRAINTS

The objective for Design Option 4 is the selection of corrugated metal pipe (CMP) culverts which can operate as least as hydraulically efficiently as Design Option No. 3 during passage of major flood flows, with the constraint that the vertical maximum dimensions (approximately) of the culverts are:

- For the Cargill Elevator Road Crossing: 48".
- For the Terminal Railroad Road Crossing: 72".

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[1] *Hydrologic and Hydraulic Analyses of Dead Creek, Cahokia, Illinois*, prepared for Solutia, Inc., by URS Greiner Woodward-Clyde, July 15, 1999.

[2] *Supplemental Study, Hydrologic and Hydraulic Analyses of Dead Creek, Cahokia, Illinois*, prepared for Solutia, Inc., by URS Greiner Woodward-Clyde, July 30, 1999.

[3] Upstream and downstream are abbreviated as U/S and D/S, respectively, in tables and figures.

To achieve the desired hydraulic efficiency, the culverts should pass the peak discharge of the 100-year flood with head losses no greater than that which occurs at the time of peak discharge as determined for Design Option No. 3. However, to provide a more comprehensive design, the passage of the 50-year flood was also considered a design objective. Culvert capacity for the 500-year flood was also computed for comparison, but was not considered as a design capacity requirement. (It was found, however, that the 500-year discharge would not have been a constraint on the design; for feasible alternatives based upon the 100-year flow, the 500-year pipe culvert capacities exceeded the 500-year peak discharge.)

Actual peak discharges for the 50-, 100-, and 500-year flood events at the two crossings, as determined in the *Supplemental Study*, for the previous Design Option No. 3 are presented in Table 1, along with other hydraulic conditions and parameters, either given in the *Supplemental Study* or estimated from data therein. Key among the parameters given in Table 1 in addition to the peak discharges are the head losses across the road embankments at the time of occurrence of the peak discharges (these head loses are termed the "Available Head Loss for Culvert Flow" in Table 1).

Some minor modifications to these constraints were allowed, as will be noted below, in identification of actual alternatives that would meet the design objectives.

METHODOLOGY

Various alternatives were identified for Design Option No. 4. Each alternative had the design goal of being able to pass the 50- and 100-year peak flood flows (as determined in the *Supplemental Study*) with a head loss no greater than the computed head loss for the Design Option No. 3.

To determine necessary pipe size and pipe size combinations that could meet this requirement, the discharges for various potential alternative designs were determined for the 50- and 100-year peak flows for a head loss equal to that determined to occur simultaneously with the Design Option No. 3 peak discharges (i.e., the "Available Head Loss for Culvert Flow" of Table 1).

The computations of discharge for the available head loss were made using standard hydraulic calculations for culvert flows, with pipe roughness and entrance and exit loss coefficients determined from the engineering literature[4,5,6]. Actual calculations were performed via computer spreadsheet.

[4] Modern Sewer Design, American Iron and Steel Institute, Washington, D.C., First Edition, 1980.
[5] Hydraulic Manual, Texas Highway Dept., Bridge Division, Second Edition, September, 1970.
[6] HEC-2, Water Surface Profiles, User's Manual, Appendix B, U.S. Army Corps of Engineers, Hydrologic Engineering Center, Rept. CPD-2A, September 1990.

SPECIFICATIONS FOR ALTERNATIVES

The capacity of a culvert pipe depends upon diameter, roughness, head and tail water heights (which are related to the head loss), and the entrance and exit losses in the pipe, the latter losses depending upon the configuration of the entrance and exit to the pipe. Roughness of corrugated pipe depends upon diameter and the type of corrugations. Consequently, a variety of possibilities for a specific design which provides sufficient capacity exist. Therefore, a range of options of pipe size, corrugation size and type, and entrance and exit configurations were considered. These are summarized in the general design specifications of Table 2, which also lists the length, slope, and culvert invert elevations assumed for the design as based upon the estimated dimensions of the two crossings. Other corrugation dimensions and entrance and exit configurations can be substituted in place of those specified in Table 2 if the substitutions make a pipe more hydraulically efficient.

Because of the size constraints on the potential pipe sizes, the necessary discharge capacity could not be achieved with a single pipe. Multiple pipes were necessary for a particular potential alternative. To reduce excessive capacity (and consequent cost), the pipe sizes in a group of pipes for a particular alternative were not always the same. For the same entrance and exit configurations, pipe sizes specified for a particular alternative can always, of course, be increased if construction is facilitated and costs remain acceptable.

In addition to the corrugated metal pipes, the capacity of a simple concrete box culvert design was computed for comparison purposes. The entrance and exit configuration assumed for the box culvert (straight, projecting walls) is also listed in the general design specifications listed in Table 2. Each barrel of the culvert is assumed to be square and of similar dimensions.

FEASIBLE ALTERNATIVES

Tables 3 and 4 summarizes (for the Cargill Elevator Road Crossing and the Terminal Railroad Road Crossing, respectively) identified feasible alternatives from a larger number of potential alternatives considered as a potential design for actual construction. Pipe combinations consisting of larger pipes which would provide the necessary capacity are feasible, but would have excessive capacity and consequently incur unnecessarily large costs for construction. The listed pipe combinations represent a range of pipe sizes which generally provide sufficient, but not excessive, capacity.

The pipe combination options presented in Tables 3 and 4 have either "acceptable" capacity or "marginal" capacity. The discharge capacity of an "acceptable" option exceeds the required capacity for both the 50- and 100-year peak discharges. The discharge capacity of a "marginal" option exceeds the required capacity for either the required 50-year peak flow or the required 100-year peak flow, but not both. These "marginal" designs were included for consideration since in the "marginal" designs, the capacity deficiency was not excessive and would, in light of the uncertainty in actual

flood flow magnitudes, be acceptable from a practical standpoint. Generally, however, a recommended design was drawn from the "acceptable" group of options.

The options listed in Table 3 and 4 were screened from the initial possibilities with regard to approximate overall trench width. Estimated total trench width was based upon all pipes having the same invert and approximately 1 foot between pipes. The estimated trench widths are listed in Tables 3 and 4 and, when compared to the creek cross sections of Figures 1 and 2, appear to be of acceptable width for construction.

All feasible options for the Cargill Elevator Road Crossing were selected from pipe sizes in the range of 18" to 54" diameter. (Actual minimum pipe sizes in the feasible options included no pipe size less than 24" diameter.) Pipe diameters of 54" exceed the previously stated limit of 48", but were considered since such diameters (in light of creek section shape) might be acceptable and appeared to offer potentially cost effective options.

All feasible options for the Terminal Railroad Road Crossing were selected from pipe sizes in the range of 48" to 72" diameter, the upper limit being based upon required maximum size and lower limit being based upon generally constructability (not having radically different pipe sizes and maintaining a reasonable size of overall trench width) and the sizes necessary to provide the required capacity.

RECOMMENDED CULVERT DESIGN SIZES

To facilitate the selection of recommended design from the feasible alternatives, an approximate cost index was used. This index, based upon correlation[7] of reported bids for CMP construction for a range of pipe culvert sizes[8], related bid cost per foot to pipe diameter. Since only relative costs were needed for the index (and actual levels of cost could be expected to be different because of the passage of time since the data were developed), all pipe costs were normalized by the per foot cost for 48" diameter pipe.

The cost index was applied to each pipe in the set of pipes composing a feasible option to obtain an overall index price. The computed index prices for each feasible alternative are listed in Tables 3 and 4. Since no economy of scale for installation of multiple pipes (as opposed to separate installation of the same number of pipes) is accounted for, the index likely (in a relative sense) over estimates the cost of options with a larger number of pipes.

From review of the feasible options and their capacity ("acceptable" or "marginal"), index costs, number of pipes, and general pipe size range, a limited number (three for both crossings) of recommend alternatives was identified. (For comparison only, a preferred box culvert option was also identified.)

[7] The cost data presented in the data source were correlated to diameter as part of this study; the correlation was high.

[8] Modern Sewer Design, American Iron and Steel Institute, Washington, D.C., First Edition, 1980.

For the Cargill Elevator Road Crossing, the three recommended options are (see Table 3):

1. Three 48" diameter CMPs with helical corrugations and inlet headwall and wing walls or beveled ring entrance.
2. Three 48" diameter CMPs with helical corrugations and projecting inlet.
3. Two 54" diameter CMPs with helical corrugations and inlet headwall and wing walls or beveled ring entrance

Recommended option 1 above is preferred over option 2 since it has more capacity than option 2, but the cost of option 2 may be significant less than option 1 because of the type of entrance and exit configuration of option 2.

Because recommended option 3 has only marginal capacity, this option is recommended only if its cost is significantly lower than the other two options.

The three recommended options identified for the Terminal Railroad Road Crossing are (see Table 4):

1. Four 66" and one 54" diameter CMPs with annular corrugations and projecting inlet.
2. Four 72" diameter CMPs with helical corrugations and inlet headwall and wing walls or beveled ring entrance.
3. Three 72" and two 54" diameter CMPs, with helical corrugations and inlet headwall and wing walls or beveled ring entrance.

Recommended option 1 is preferred over recommended option 2 because it has "acceptable" capacity while option 2 has only "marginal" (but almost "acceptable") capacity. Construction of option 2 can be expected to incur greater cost than option 1, although option 2 has uniform pipe sizes. The cost indices for options 2 and 3 are sufficiently close to suggest that option 3 may have less construction cost than option 2.

Further screening of recommendations should be based upon actual bid costs for the recommended alternatives.

DESIGN OPTIONS NO. 4 CULVERT DESIGN FOR TERMINAL RAILROAD EMBANKMENT AND CARGILL TERMINAL ROAD CROSSINGS OF DEAD CREEK, CAHOKIA, ILLINOIS

TABLE 1. GENERAL FEATURES OF CROSSINGS

	Cargill Elevator Rd	Terminal RR Rd
Existing flow line at U/S end of crossing (ft)	397.50	396.66
Existing pipe invert/DS (ft)	396.65	395.40
U/S station (mi)	1.213	1.191
D/S station (mi)	1.194	1.150
U/S water surface (ft) (Note 1)		
50 Year Flood	401.90	401.59
100 Year Flood	402.31	401.89
500 Year Flood	402.86	402.29
D/S water surface (ft) (Note 2)		
50 Year Flood	401.59	401.55
100 Year Flood	401.89	401.84
500 Year Flood	401.29	401.18
Headwater Depth, ft		
50 Year Flood	4.40	4.93
100 Year Flood	4.81	5.23
500 Year Flood	5.36	5.63
Tailwater Depth, ft		
50 Year Flood	4.94	6.15
100 Year Flood	5.24	6.44
500 Year Flood	4.64	5.78
Discharge (cfs)		
50 Year Flood	106.55	109.46
100 Year Flood	125.20	129.46
500 Year Flood	146.70	152.90
Minimal Length of Culvert-mi	0.009	0.02
Upstream Invert	397.50	396.66
Downstream Invert	396.65	395.40
Rise in Flow Line from D/S to U/S	0.85	1.26
Distance from Upstream to Downstream Sections (for culverts), ft	47.52	105.6
Existing Flow Line Slope	0.0179	0.0119
Available Head Loss for Culvert Flow (from U/S embankment face to D/S embankment face)		
50 Year Flood	0.310	0.043
100 Year Flood	0.420	0.049
500 Year Flood	1.569	1.102
Friction Slope Between U/S and D/S of Embankment Crossing		
50 Year Flood	0.0065	0.0004
100 Year Flood	0.0088	0.0005
500 Year Flood	0.0330	0.0104

Notes
1 As reported in *Supplement Study*
2 As estimated from reported values in *Supplemental Study*

DESIGN OPTIONS NO. 4: HYDRAULIC CULVERT DESIGN FOR ROAD CROSSINGS OF DEAD CREEK, CAHOKIA, ILLINOIS

TABLE 2. GENERAL SPECIFICATIONS ASSUMED FOR CULVERT DESIGN

Culvert Features

	Cargill Elevator Road	Terminal RR Road
Culvert Length, ft	47.5	105.6
Pipe Slope, ft/ft	0.0179	0.0119
Upstream Invert Elevation,	397.5	396.66

Corrugated Metal Pipe Features

Annular Pipe, when specified, 2-2/3 x 1/2 inch corrugations
Helical Pipe, when specified, 2-2/3 x 1/2 inch corrugations for sizes up to and including 36 inch diameter
Helical Pipe, when specified, 3 x 1 inch corrugations for sizes larger than 36 inch diameter
All pipe assumed to be unpaved; partial or full paved pipe can be substituted for unpaved

Corrugated Metal Pipe Entrance and Exit Design

Projecting Entrance: Pipe projects from fill without headwall
Inlet headwall and wingwalls: Use entrance rounding at headwall, equal flare angles on wingwalls with flare angle of nominal 45 degrees
Beveled ring entrance can be use in place of inlet headwall and wingwalls
Other entrance configuration can be substituted if more hydraulically efficient than headwall & wingwalls
Exit design should be similar to entrance design

Concrete Box Culvert

Straight, projecting walls with no beveling assumed; beveling and flared wingwalls can be substituted

DESIGN OPTIONS NO. 4: HYDRAULIC CULVERT DESIGN FOR ROAD CROSSINGS OF DEAD CREEK, CAHOKIA, ILLINOIS

TABLE 3. CARGILL ELEVATOR TERMINAL ROAD CULVERT DESIGN NO. 4 OPTIONS

			Flood Frequency:				
			50 Yr	100 Yr	500 Yr		
			Discharges, cfs				
TARGET DISCHARGES							
Peak Flood Discharge At Cargill Elevator Road To Be Passed By Design No 4 Option (Note 1)			106.6	125.2	146.7		
DISCHARGE CAPACITY FOR VARIOUS ALTERNATIVES							
Alternative Pipe Combinations	**Approximate Minimum Trench Width, ft (Note 3)**		**50 Yr**	**100 Yr**	**500 Yr**	**Cost Index**	
			Discharges, cfs				
Design Option No. 3 - *CMP* (Note 2)							
1-72"	7.5		107.6	126.2	241.2		
CORRUGATED METAL PIPE							
Annular - with projecting inlet							
3-54"	16.0	Acceptable	153.4	178.6	345.4	3.4	
4-48"	19.0	Acceptable	136.8	159.2	307.9	4.0	
3-48" & 1-36"	18.0	Acceptable	120.6	140.4	271.5	3.7	
3-48" & 1-24"	17.0	Acceptable	109.7	127.7	246.9	3.4	
6-36"	18.5	Acceptable	108.2	125.9	243.5	4.3	
CORRUGATED METAL PIPE							
Helical - with projecting inlet							
3-54"	16.0	Acceptable	137.0	159.4	308.4	3.4	
4-48"	19.0	Acceptable	143.4	166.9	322.8	4.0	
3-48"	14.5	Acceptable	107.5	125.2	242.1	3.0	Recommended Pipe
2-48" & 2-36"	17.0	Acceptable	110.6	128.8	249.0	3.4	
CORRUGATED METAL PIPE							
Helical - with inlet headwall and wingwalls or with beveled ring entrance							
3-54"	16.0	Acceptable	160	186	361	3.4	
2-54"	11.0	Marginal	107	124	240	2.3	Recommended Pipe
3-48"	14.5	Acceptable	125	146	282	3.0	Recommended Pipe
1-48" & 3-36"	16.0	Acceptable	109	127	246	3.1	
CONCRETE BOX CULVERT WITH SQUARE BARRELS (note 4)							
5-54"	24.3	Acceptable	123	132	190		
6-48"	26.0	Marginal	116	124	179		Preferred Box Culvert
11-36"	36.3	Marginal	117	125	164		

Notes

1 Target discharges as determined in *Supplemental Study*

2 Design Option No. 3 from *Supplemental Study*

3 Trench width assumes 1 ft between pipes and 6 inch minimum between trench wall and pipe

4 Box culverts assumed to have straight wingwalls and 6" wall thickness

DESIGN OPTIONS NO. 4: HYDRAULIC CULVERT DESIGN FOR ROAD CROSSINGS OF DEAD CREEK, CAHOKIA, ILLINOIS

TABLE 4. TERMINAL RAILROAD ROAD CULVERT DESIGN NO. 4 OPTIONS

	Flood Frequency		
	50 Yr	100 Yr	500 Yr
TARGET DISCHAGES	Discharges In cfs		
Peak Flood Discharge At Terminal Railroad Road To Be Passed By Design No 4 Option (Note 1)	109.5	129.5	152.9

DISCHARGE CAPACITY FOR VARIOUS ALTERNATIVES

Alternative Pipe Combinations	Approximate Minimum Trench Width, ft (Note 2)		Flood Frequency 50 Yr	100 Yr	500 Yr	Cost Index	
			Discharges In cfs				
CORRUGATED METAL PIPE							
Annular - with projecting inlet							
4-72"	27.0	Marginal	109.8	118.0	169.8	7.3	
4-72" & 1-48"	30.5	Acceptable	120.8	129.7	186.7	8.3	
3-72" & 3-54"	34.0	Acceptable	125.3	134.6	193.8	8.9	
3-72" & 2-54"	29.5	Marginal	111.0	119.2	171.6	7.8	
2-72" & 4-60"	34.0	Acceptable	127.8	137.2	197.5	10.5	
2-72" & 3-60"	29.0	Marginal	109.6	117.6	169.4	8.8	
2-72" & 5-54"	36.5	Acceptable	126.5	135.9	195.6	9.3	
2-72" & 4-54"	32.0	Marginal	112.2	120.5	173.4	8.2	
5-66"	31.0	Marginal	113.0	121.3	174.6	8.8	
5-66" & 1-48"	34.5	Acceptable	123.9	133.0	191.5	9.8	
4-66" & 1-54"	29.5	Acceptable	124.2	133.3	191.9	8.2	Recommended Pipe
4-66" & 3-48"	35.5	Acceptable	123.1	132.2	190.3	10.0	
4-66" & 2-48"	32.0	Marginal	112.2	120.5	173.4	9.1	
6-60" & 1-54"	35.5	Acceptable	123.6	132.7	191.1	11.4	
6-60" & 1-48"	34.5	Marginal	120.2	129.1	185.8	11.2	
5-60" & 2-54"	35.0	Marginal	119.7	128.5	185.0	10.8	
5-60" & 3-48"	36.5	Acceptable	123.8	132.9	191.4	11.5	
CORRUGATED METAL PIPE							
Helical - with projecting inlet							
4-72"	27.0	Marginal	109.8	118.0	169.8	7.3	
4-72" & 1-48"	30.5	Acceptable	121.0	129.9	187.0	8.3	
3-72" & 3-54"	34.0	Acceptable	123.7	132.9	191.3	8.9	
2-72" & 4-60"	34.0	Acceptable	126.2	135.5	195.0	10.5	
2-72" & 4-54"	32.0	Marginal	111.7	119.9	172.6	8.2	
6-60" & 1-54"	35.5	Acceptable	123.8	133.0	191.5	11.4	
6-60" & 1-48"	34.5	Marginal	120.4	129.3	186.1	11.2	
5-60" & 2-54"	35.0	Marginal	120.2	129.1	185.9	10.8	
5-60" & 3-48"	36.5	Acceptable	124.4	133.6	192.4	11.5	

DESIGN OPTIONS NO. 4: HYDRAULIC CULVERT DESIGN FOR ROAD CROSSINGS OF DEAD CREEK, CAHOKIA, ILLINOIS

TABLE 4. TERMINAL RAILROAD ROAD CULVERT DESIGN NO. 4 OPTIONS

	Flood Frequency		
	50 Yr	100 Yr	500 Yr
TARGET DISCHAGES	Discharges In cfs		
Peak Flood Discharge At Terminal Railroad Road To Be Passed By Design No 4 Option (Note 1)	109.5	129.5	152.9

DISCHARGE CAPACITY FOR VARIOUS ALTERNATIVES

Alternative Pipe Combinations	Approximate Minimum Trench Width, ft (Note 2)		Flood Frequency 50 Yr	100 Yr	500 Yr	Cost Index	
			Discharges In cfs				
CORRUGATED METAL PIPE							
Helical - with inlet headwall and wingwalls or with beveled ring entrance							
4- 72"	27.0	Marginal	119.9	128.8	185.4	7.3	Recommended Pipe
4-72" & 1-48"	30.5	Acceptable	132.3	142.0	204.5	8.3	
3-72" & 2-54"	29.5	Acceptable	122.5	131.6	189.4	7.8	Recommended Pipe
2-72" & 4-54"	32.0	Acceptable	125.1	134.3	193.4	8.2	
6-66"	37.0	Acceptable	122.4	131.4	189.2	10.6	
5-66" & 1-54"	38.0	Marginal	118.2	127.0	182.8	10.3	
4-66" & 3-48"	35.5	Marginal	118.5	127.3	183.3	10.0	
6-60" & 1-48"	34.5	Acceptable	121.6	130.6	188.0	11.2	
5-60" & 2-54"	35.0	Acceptable	123.6	132.8	191.1	10.8	
5-60" & 3-48"	36.5	Acceptable	128.0	137.5	197.9	11.5	
5-60" & 2-48"	33.0	Marginal	115.7	124.3	178.9	10.5	
CONCRETE BOX CULVERT WITH SQUARE BARRELS (note 3)							
3-72"	20.5	Acceptable	128.3	137.8	198.3		
4-60"	21.0	Marginal	116.7	125.3	180.4		Preferred Box Culvert
7-48"	25.5	Acceptable	127.2	136.6	196.6		

Notes

1 Target discharges as determined in *Supplemental Study*

2 Trench width assumes 1 ft between pipes and 6 inch minimum between trench wall and pipe

3 Box culverts assumed to have straight wingwalls and 6" wall thickness

Figure 1.
Cargill Elevation Road Sections
(Section in Flood Plain Not Fully Shown)

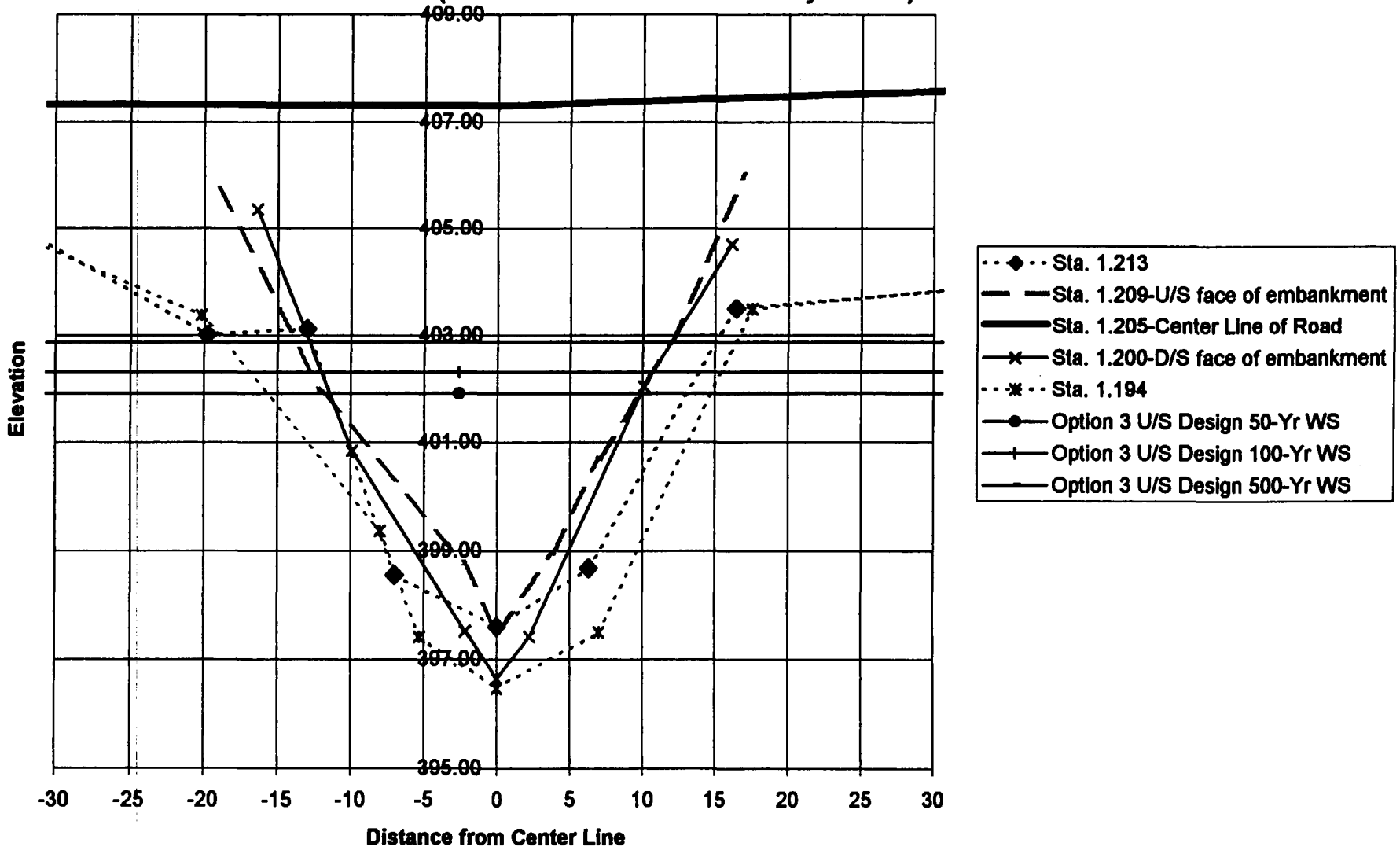
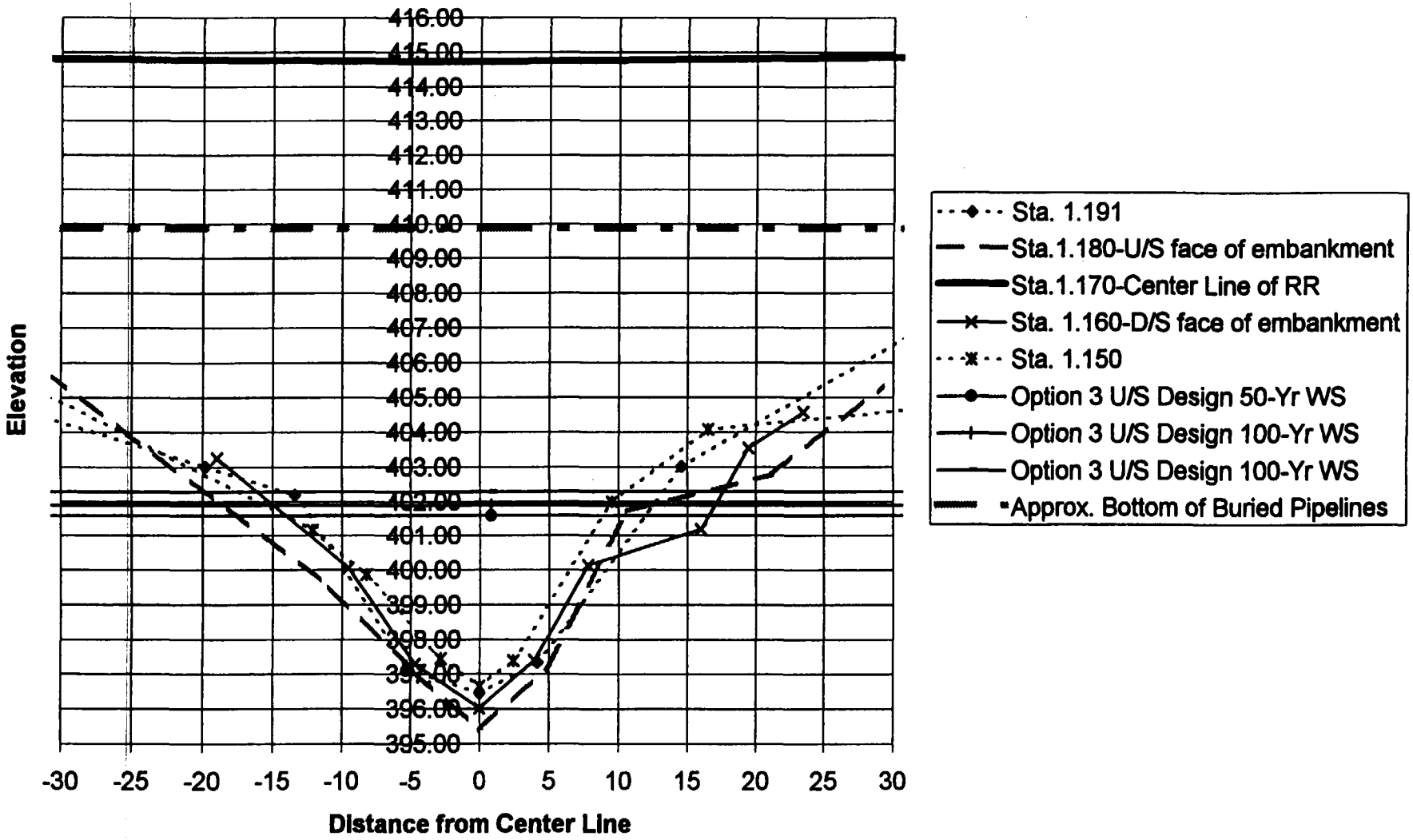


Figure 2. Terminal Railroad Road Sections
(Portions of Section in Flood Plain Not Fully Shown)

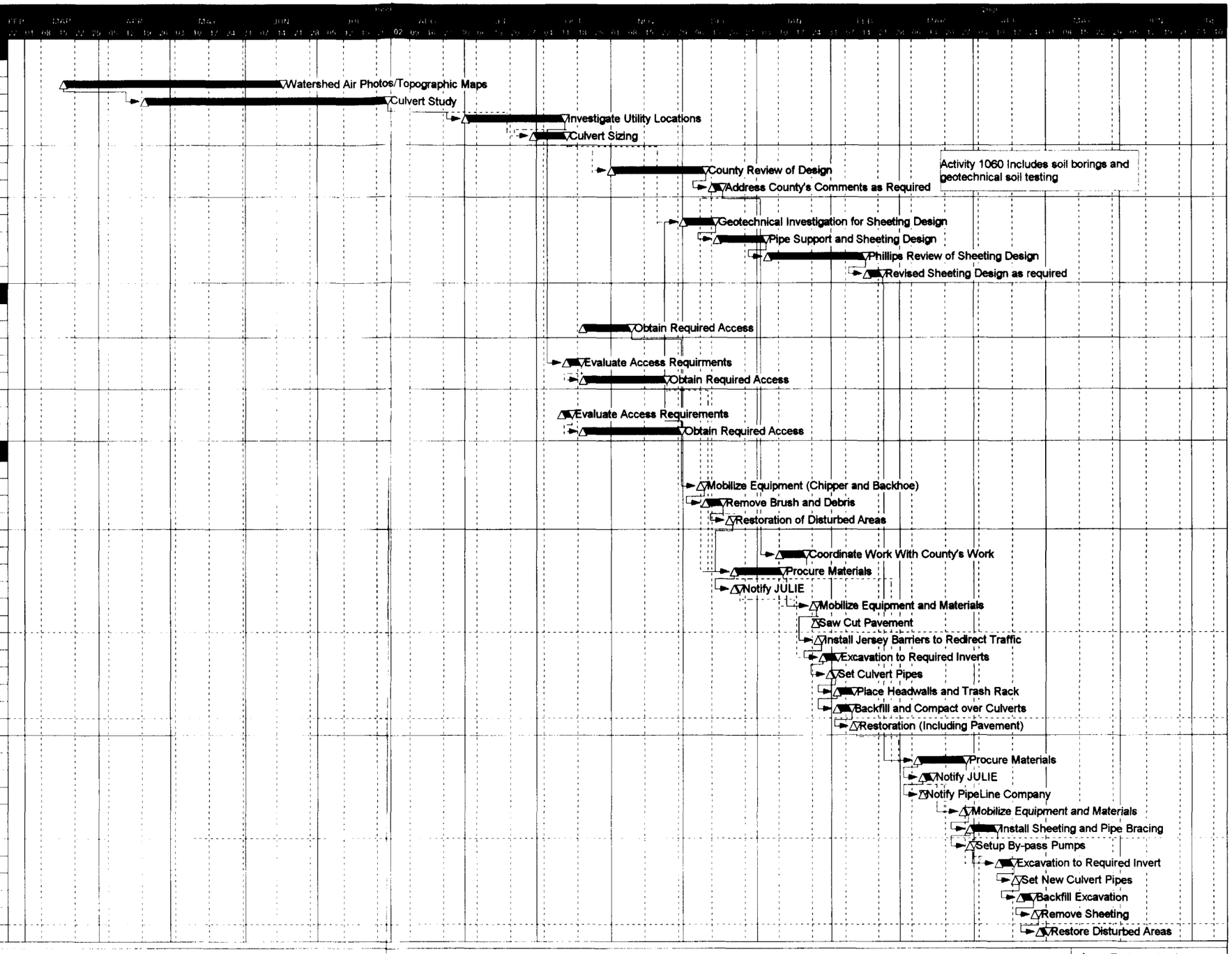


CULVERTS

REPLACEMENT

SCHEDULE

Act ID	Description	Orig Dur	Early Start	Early Finish
Study/Design				
Creek Wide				
2001	Watershed Air Photos/Topographic Maps	1d	17MAR99 A	16JUN99 A
2002	Culvert Study	1d	20APR99 A	30JUL99 A
2003	Investigate Utility Locations	30d	01SEP99	12OCT99
2004	Culvert Sizing	10d	29SEP99 *	13OCT99
Cargill Road				
2005	County Review of Design	30d	01NOV99 *	10DEC99
2006	Address County's Comments as Required	5d	13DEC99	17DEC99
RailRoad				
2007	Geotechnical Investigation for Sheeting	10d	01DEC99	14DEC99
2008	Pipe Support and Sheeting Design	15d	15DEC99	04JAN00
2009	Phillips Review of Sheeting Design	30d	05JAN00	15FEB00
2010	Revised Sheeting Design as required	5d	16FEB00	22FEB00
Access				
Area F				
3001	Obtain Required Access	15d	20OCT99 *	09NOV99
Cargill Road				
3002	Evaluate Access Requirments	5d	13OCT99 *	19OCT99
3003	Obtain Required Access	25d	20OCT99 *	24NOV99
RailRoad				
3004	Evaluate Access Requirements	5d	11OCT99 *	15OCT99
3005	Obtain Required Access	30d	20OCT99 *	30NOV99
Construction				
Area F				
4001	Mobilize Equipment (Chipper and Backhoe)	2d	08DEC99	09DEC99
4002	Remove Brush and Debris	6d	10DEC99	17DEC99
4003	Restoration of Disturbed Areas	2d	20DEC99	21DEC99
Cargill Road				
5001	Coordinate Work With County's Work	10d	10JAN00	21JAN00
5002	Procure Materials	15d	22DEC99	11JAN00
5003	Notify JULIE	3d	22DEC99	24DEC99
5004	Mobilize Equipment and Materials	2d	24JAN00	25JAN00
5005	Saw Cut Pavement	1d	25JAN00	25JAN00
5006	Install Jersey Barriers to Redirect Traffic	2d	26JAN00	27JAN00
5007	Excavation to Required Inverts	5d	28JAN00	03FEB00
5008	Set Culvert Pipes	3d	31JAN00	02FEB00
5009	Place Headwalls and Trash Rack	6d	03FEB00	10FEB00
5010	Backfill and Compact over Culverts	5d	03FEB00	09FEB00
5011	Restoration (Including Pavement)	2d	10FEB00	11FEB00
RailRoad				
6001	Procure Materials	15d	08MAR00	28MAR00
6002	Notify JULIE	3d	10MAR00	14MAR00
6003	Notify PipeLine Company	1d	10MAR00	10MAR00
6004	Mobilize Equipment and Materials	3d	27MAR00	29MAR00
6005	Install Sheeting and Pipe Bracing	8d	30MAR00	10APR00
6006	Setup By-pass Pumps	2d	30MAR00	31MAR00
6007	Excavation to Required Invert	5d	11APR00	17APR00
6008	Set New Culvert Pipes	2d	18APR00	19APR00
6009	Backfill Excavation	4d	20APR00	25APR00
6010	Remove Sheeting	2d	26APR00	27APR00
6011	Restore Disturbed Areas	2d	28APR00	01MAY00



Start date	01MAR99
Finish date	01MAY00
Data date	01SEP99
Run date	27OCT99
Page number	1A

Dead Creek Culvert Replacement

△ Early start point
▽ Early finish point
Early bar
Progress bar
Critical bar
Summary bar
◆ Start milestone point
◆ Finish milestone point